REMARKS

Claims 1-9 are pending in this application, with claims 2-4 and 7-9 being withdrawn from consideration. Claims 1, 5 and 6 are rejected under 35 USC 112, first paragraph, as failing to comply with the written description. Claim 1 is rejected under 35 USC 102 as being anticipated by Miglietti. Claims 1, 5 and 6 are rejected under 35 USC 103 as being unpatentable over Miglietti view of Linden.

Rejection under 35 USC 112, second paragraph:

The Examiner finds that the applicant does not have support in the specification for the entire range of either nano-sized particles or micron-sized particles of claims 1, 5 and 6, but rather only has support for particular ranges described in various embodiments disclosed in the specification. The applicant respectfully traverses this rejection as follows.

MPEP 608.01(g) requires that the detailed description must be in such particularity as to enable any person skilled in the pertinent art or science to make and use the invention without involving extensive experimentation. An applicant is ordinarily permitted to use his or her own terminology, as long as it can be understood.

The present specification clearly describes particles having two distinct size ranges: micron-sized and the smaller nano-sized, and they are described as being exclusive of each other. It is well known in the art that the prefix "nano" refers to sizes smaller than one micron (10^{-6} to 10^{-9} meters), and that the prefix "micro" refers to sizes smaller than one millimeter and larger than 1,000 nanometers (10^{-3} to 10^{-6} meters). Evidence of such common understanding is provided in the three attached Internet web pages where: 1) nanotechnology is defined as the field of science involving the control of matter on a scale smaller than one micrometer (page 1 of 16 of "Nanotechnology - Wikipedia"); 2) nanotechnology is used to describe research where the characteristic dimensions are less than about 1,000 nanometers (page 1 of 7 of "Nanotechnology - Created by Dr. Ralph Merkle) ; and 3) where the prefix "nano" is shown to range from 0.000,000,001 meter to 0.000,001 meter and "micro" is shown to range from 0.000,001 meter to 0.001 meter (page 3 of 24 of "A Dictionary of Units"). The present specification goes on to describe particular embodiments that fall within these ranges, in

accordance with the common usage of these terms. Thus, any person skilled in the art of the present invention would understand that the invention is enabled for the entire range of nano-sized particles and micron-sized particles, and the rejection under 35 USC 112 should be withdrawn.

Rejection under 35 USC 102:

The applicant also traverses the rejection of claim 1 as being anticipated by Miglietti. While the Examiner admits that Miglietti discloses 40 micron powder, he bases this rejection on an interpretation of 40 microns as being 40,000 nanometers. However, the terms of the claims must be interpreted in accordance with their plain meaning, and in accordance with their usage in the specification. As evidenced by the three Internet web pages attached hereto and discussed above, the term "nano-sized" of claim 1 would clearly be understood to have a plain meaning that reads on dimensions only smaller than 1 micron. Furthermore, all of the nano-sized particle embodiments described in the specification are less than 1,000 nm, thereby providing no basis for interpreting the claim term "nano-sized" to read on particles having a size of 40,000 nanometers. Clearly, no court or person skilled in the art would interpret the term "nano-sized" as used in the present specification or as used in claim 1 to read on a 40 micron particle. Thus, the cited prior art does not support the rejection of claim 1 under 35 USC 102, and the rejection should be withdrawn.

Rejection under 35 USC 103(a):

The applicant respectfully notes that the rejection of claims 1, 5 and 6 as being unpatentable over Miglietti in view of Linden was previously made final by the Examiner and was previously appealed by the applicant to the Board of Patent Appeals and Interferences. After Appellant's Brief was filed, the Examiner elected not to pursue this rejection, but rather to reopen prosecution under MPEP 1207.04 to cite new grounds for rejection. The Examiner's decision not to pursue this rejection is an admission that the rejection is without merit, and repeating this rejection along with new grounds for rejection functions to disenfranchise the applicant of the benefit of the Board's decision regarding arguments made in the Brief and incorporated by reference herein. Furthermore, MPEP 1207.04 requires approval of the reopening of prosecution by a Supervisory Patent Examiner (SPE), but no SPE signature is

provided in the Office Communication as suggested by Form Paragraph 12.187. Accordingly, the rejection of claims 1, 5 and 6 under 35 USC 103(a) in view of Miglietti and Linden is respectfully traversed on both procedural and substantive grounds, and the rejection should be withdrawn.

New claims:

New claims 24-26 are added herein to specifically delimit particular particle size ranges and characteristics. These claims are supported in the specification and no new matter has been added.

Conclusion

The applicant requests reconsideration of the amended application in light of the above amendments and remarks. Upon the allowance of generic claim 1, consideration of the withdrawn claims is also requested.

Respectfully submitted,

David G. Maire (Reg. No. 34,865)

Beusse Wolter Sanks Mora & Maire, P.A.
390 North Orange Ave., Suite 2500
Orlando, FL 32801
Telephone: 407-926-7704

Nanotechnology

From Wikipedia, the free encyclopedia

Molecular gears from a NASA computer simulation.

Nanotechnology (sometimes referred to as **nanofabrication**[1] (http://whatis.techtarget.com/definition/0,,sid9_gci518307,00.html))is a field of applied science and technology covering a broad range of topics. The main unifying theme is the control of matter on a scale smaller than one micrometre, as well as the fabrication of devices on this same length scale. It is a highly multidisciplinary field, drawing from fields such as colloidal science, device physics, and supramolecular chemistry. Much speculation exists as to what new science and technology might result from these lines of research. Some view nanotechnology as a marketing term that describes pre-existing lines of research.

Despite the apparent simplicity of this definition, nanotechnology actually encompasses diverse lines of inquiry. Nanotechnology cuts across many disciplines, including colloidal science, chemistry, applied physics, biology. It could variously be seen as an extension of existing sciences into the nanoscale, or as a recasting of existing sciences using a newer, more modern term. Two main approaches are used in nanotechnology: one is a "bottom-up" approach where materials and devices are built from molecular components which assemble themselves chemically using principles of molecular recognition; the other being a "top-down" approach where nano-objects are constructed from larger entities without atomic-level control.

The impetus for nanotechnology has stemmed from a renewed interest in colloidal science, coupled with a new generation of analytical tools such as the atomic force microscope (AFM) and the scanning tunneling microscope (STM). Combined with refined processes such as electron beam lithography, these instruments allow the deliberate manipulation of nanostructures, and in turn led to the observation of novel phenomena. Nanotechnology is also an umbrella description of emerging technological developments associated with sub-microscopic dimensions. Despite the great promise of numerous nanotechnologies such as quantum dots and nanotubes, real applications that have moved out of the lab and into the marketplace have mainly utilized the advantages of colloidal nanoparticles in bulk form, such as suntan lotion, cosmetics, protective coatings, and stain resistant clothing.

Contents

Nanotechnology

Created by Dr. Ralph Merkle

Hosted by zyvex

RECENT NEWS:

- Sample chapters and an extended table of contents for Drexler's technical book, *Nanosystems: Molecular Machinery, Manufacturing, and Computation* are now available at his website, e-drexler.com.
- Nanorex is designing and modeling molecular machine components.
- Foresight's Nanotechnology Roadmap Initiative
- New book on *Kinematic Self-Replicating Machines* by Robert Freitas and Ralph Merkle now available.

The next few paragraphs provide a brief introduction to the core concepts of molecular nanotechnology, followed by links to further reading.

Manufactured products are made from atoms. The properties of those products depend on how those atoms are arranged. If we rearrange the atoms in coal we can make diamond. If we rearrange the atoms in sand (and add a few other trace elements) we can make computer chips. If we rearrange the atoms in dirt, water and air we can make potatoes.

Todays manufacturing methods are very crude at the molecular level. Casting, grinding, milling and even lithography move atoms in great thundering statistical herds. It's like trying to make things out of LEGO blocks with boxing gloves on your hands. Yes, you can push the LEGO blocks into great heaps and pile them up, but you can't really snap them together the way you'd like.

In the future, nanotechnology will let us take off the boxing gloves. We'll be able to snap together the fundamental building blocks of nature easily, inexpensively and in most of the ways permitted by the laws of physics. This will be essential if we are to continue the revolution in computer hardware beyond about the next decade, and will also let us fabricate an entire new generation of products that are cleaner, stronger, lighter, and more precise.

It's worth pointing out that the word "nanotechnology" has become very popular and is used to describe many types of research where the characteristic dimensions are less than about 1,000 nanometers. For example, continued improvements in lithography have resulted in line widths that are less than one micron: this work is often called "nanotechnology." Sub-micron lithography is clearly very valuable (ask anyone who uses a computer!) but it is equally clear that conventional lithography will not let us build semiconductor devices in which individual dopant atoms are located at specific lattice sites. Many of the exponentially improving trends in computer hardware capability have remained steady for the last 50 years. There is fairly widespread belief that these trends are likely to continue for at least another several years, but then conventional lithography starts to reach its limits.

A Dictionary of Units

by *Frank Tapson*

This provides a summary of most of the units of measurement to be found in use around the world today (and a few of historical interest), together with the appropriate conversion factors needed to change them into a 'standard' unit of the SI.

The units may be found either by looking under the in which they are used, (length energy etc.)	**category**
or by picking one unit from an alphabetically ordered	**list of units**.
There is an outline of the	**S I system,**
a list of its 7 basic	**definitions,**
some of its	**derived units,**
together with a list of all the	**S I prefixes,**
and some of the rules and conventions for	**its usage.**
On the subject of measures generally, there is a short	**historical note.**
Then there are descriptions of the	**Metric system,**
and the	**U K (Imperial) system,**
followed by statements on the implementation of	**'metrication' in the U K,**
and then the	**U S system of measures.**
At the bottom of this document is a	**list of other sources,**
and also some links to other	**Web sites.**
Finally there are some	**notes on this material**.

A more extensive (3-part) version of this dictionary will be found at www.ex.ac.uk/trol/dictunit/

The Systeme International [S I]

Le Systeme international d'Unites officially came into being in October 1960 and has been officially recognised and adopted by nearly all countries, though the amount of actual usage varies considerably. It is based upon 7 principal units, 1 in each of 7 different categories -

Category	Name	Abbrev.
Length	metre	m
Mass	kilogram	kg
Time	second	s
Electric current	ampere	A
Temperature	kelvin	K
Amount of substance	mole	mol
Luminous intensity	candela	cd

Definitions of these basic units are given. Each of these units may take a prefix. From these basic units many other units are derived and named.

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Definitions of the Seven Basic S I Units

metre [m]
The metre is the basic unit of length. It is the distance light travels, in a vacuum, in 1/299792458*th* of a second.

kilogram [kg]
The kilogram is the basic unit of mass. It is the mass of an international prototype in the form of a platinum-iridium cylinder kept at Sevres in France. *It is now the only basic unit still defined in terms of a material object, and also the only one with a prefix[kilo] already in place.*

second [s]
The second is the basic unit of time. It is the length of time taken for 9192631770 periods of vibration of the caesium-133 atom to occur.

ampere [A]
The ampere is the basic unit of electric current. It is that current which produces a specified force between two parallel wires which are 1 metre apart in a vacuum.*It is named after the French physicist Andre Ampere (1775-1836).*

kelvin [K]
The kelvin is the basic unit of temperature. It is 1/273.16*th* of the thermodynamic temperature of the triple point of water. *It is named after the Scottish mathematician and physicist William Thomson 1st Lord Kelvin (1824-1907).*

mole [mol]
The mole is the basic unit of substance. It is the amount of substance that contains as many elementary units as there are atoms in 0.012 kg of carbon-12.

candela [cd]
The candela is the basic unit of luminous intensity. It is the intensity of a source of light of a specified frequency, which gives a specified amount of power in a given direction.

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Derived Units of the S I

From the 7 basic units of the SI other units are derived for a variety of purposes. Only a few of are explained here as examples, there are many more.

farad [F]
The farad is the SI unit of the capacitance of an electrical system, that is, its capacity to store electricity. It is a rather large unit as defined and is more often used as a microfarad. *It is named after the English chemist and physicist Michael Faraday (1791-1867).*

hertz [Hz]
The hertz is the SI unit of the frequency of a periodic phenomenon. One hertz indicates that 1 cycle of the phenomenon occurs every **second**. For most work much higher frequencies are needed such as the kilohertz [kHz] and megahertz [MHz]. *It is named after the German physicist Heinrich Rudolph Hertz (1857-94).*

joule [J]
The joule is the SI unit of work or energy. One joule is the amount of work done when an applied force of 1 **newton** moves through a distance of 1 **metre** in the

direction of the force. *It is named after the English physicist James Prescott Joule (1818-89).*

newton [N]

The newton is the SI unit of force. One newton is the force required to give a mass of 1 **kilogram** an acceleration of 1 **metre** per **second** per **second.** *It is named after the English mathematician and physicist Sir Isaac Newton (1642-1727).*

ohm [Ω]

The ohm is the SI unit of resistance of an electrical conductor. Its symbol, is the capital Greek letter 'omega'. *It is named after the German physicist Georg Simon Ohm (1789-1854).*

pascal [Pa]

The pascal is the SI unit of pressure. One pascal is the pressure generated by a force of 1 **newton** acting on an area of 1 square **metre**. It is a rather small unit as defined and is more often used as a kilopascal [kPa]. *It is named after the French mathematician, physicist and philosopher Blaise Pascal (1623-62).*

volt [V]

The volt is the SI unit of electric potential. One volt is the difference of potential between two points of an electical conductor when a current of 1 **ampere** flowing between those points dissipates a power of 1 **watt.** *It is named after the Italian physicist Count Alessandro Giuseppe Anastasio Volta (1745-1827).*

watt [W]

The watt is used to measure power or the rate of doing work. One watt is a power of 1 **joule** per **second.** *It is named after the Scottish engineer James Watt (1736-1819).*

Note that prefixes may be used in conjunction with any of the above units.

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The Prefixes of the S I

The S I allows the sizes of units to be made bigger or smaller by the use of appropriate prefixes. For example, the electrical unit of a watt is not a big unit even in terms of ordinary household use, so it is generally used in terms of 1000 watts at a time. The prefix for 1000 is *kilo* so we use kilowatts[kW] as our unit of measurement. For makers of electricity, or bigger users such as industry, it is common to use megawatts[MW] or even gigawatts[GW]. The full range of prefixes with their [symbols or abbreviations] and their multiplying factors *which are also given in other forms* is

yotta	[Y]	1 000 000 000 000 000 000 000 000	= 10^24
zetta	[Z]	1 000 000 000 000 000 000 000	= 10^21
exa	[E]	1 000 000 000 000 000 000	= 10^18
peta	[P]	1 000 000 000 000 000	= 10^15
tera	[T]	1 000 000 000 000	- 10^12
giga	[G]	1 000 000 000	*(a thousand millions = a billion)*
mega	[M]	1 000 000	*(a million)*
kilo	[k]	1 000	*(a thousand)*
hecto	[h]	100	*(a hundred)*
deca	[da]	10	*(ten)*
		1	
deci	[d]	0.1	*(a tenth)*
centi	[c]	0.01	*(a hundredth)*
milli	[m]	0.001	*(a thousandth)*
micro	[µ]	0.000 001	*(a millionth)*
nano	[n]	0.000 000 001	*(a thousand millionth)*

pico	[p]	0.000 000 000 001	= 10^-12
femto	[f]	0.000 000 000 000 001	= 10^-15
atto	[a]	0.000 000 000 000 000 001	= 10^-18
zepto	[z]	0.000 000 000 000 000 000 001	= 10^-21
yocto	[y]	0.000 000 000 000 000 000 000 001	= 10^-24

[µ] the symbol used for **micro** is the Greek letter known as 'mu'
Nearly all of the S I prefixes are multiples (kilo to yotta) or sub-multiples (milli to yocto) of 1000. However, these are inconvenient for many purposes and so **hecto, deca, deci,** and **centi** are also used. **deca** also appears as **deka [da]** or **[dk]** in the USA and Contintental Europe. So much for standards!
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Conventions of Usage in the S I

There are various rules laid down for the use of the SI and its units as well as some observations to be made that will help in its correct use.

- Any unit may take only ONE prefix. For example 'millimillimetre' is incorrect and should be written as 'micrometre'.
- Most prefixes which make a unit bigger are written in capital letters (M G T etc.), but when they make a unit smaller then lower case (m n p etc.) is used. Exceptions to this are the kilo [k] to avoid any possible confusion with kelvin [K]; hecto [h]; and deca [da] or [dk]
- It will be noted that many units are eponymous, that is they are named after persons. This is always someone who was prominent in the early work done within the field in which the unit is used. Such a unit is written all in lower case (newton, volt, pascal etc.) when named in full, but starting with a capital letter (N V Pa etc.) when abbreviated. An exception to this rule is the litre which, if written as a lower case 'l' could be mistaken for a '1' (one) and so a capital 'L' is allowed as an alternative. It is intended that a single letter will be decided upon some time in the future when it becomes clear which letter is being favoured most in use.
- Units written in abbreviated form are NEVER pluralised. So 'm' could always be either 'metre' or 'metres'. 'ms' would represent 'millisecond'.
- An abbreviation (such as J N g Pa etc.) is NEVER followed by a full-stop unless it is the end of a sentence.
- To make numbers easier to read they may be divided into groups of 3 separated by spaces (or half-spaces) but NOT commas.
- The SI preferred way of showing a decimal fraction is to use a comma (123,456) to separate the whole number from its fractional part. The practice of using a point, as is common in English-speaking countries, is acceptable providing only that the point is placed ON the line of the bottom edge of the numbers (123.456) and NOT in the middle.

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A Brief History of Measurement

One of the earliest types of measurement concerned that of length. These measurements were usually based on parts of the body. A well documented example (the first) is the